Space Weather Forecast

Issued on Tuesday, 17 September 2024 at 01:27 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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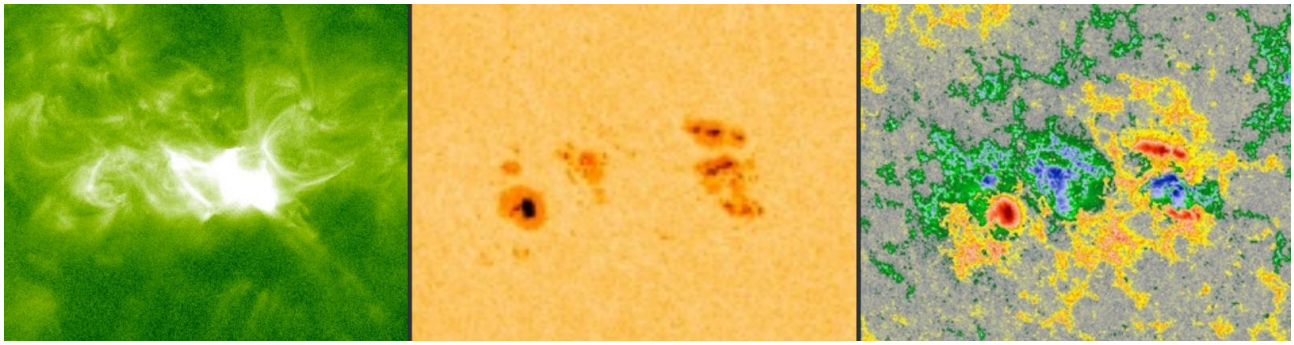
Space Weather Forecast Headline: CME arrived at near-Earth satellites at 16/2250UTC, Earth at 16/2329UTC. Minor to Moderate (G1-G2) geomagnetic storms likely. Ongoing Chance of Moderate-class x-ray flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Low, with occasional mid-ranking Common-class x-ray flares observed, peaking with one at 16/0125UTC from a sunspot in the southwest. This was trumped at the literal eleventh hour by a high-end Common-class flare from the most complex sunspot group at 16/2356UTC.

Figure 1: False colour extreme UV imagery (green), visible (yellow) and magnetic polarity (grey) of the peak flare of the period from the most complex sunspot region at 16/2356UTC.



There are up to eight sunspot regions on the facing side, with a new group rotating over the eastern solar horizon in the period. The main changes in the period were seen in both of the most complex regions - the one responsible for the UTC weekend's Strong-class x-ray flare in the southeast saw areal growth of its leading spots, although this was roughly matched by a decline in its trailers. This was the larger of the two main groups, however also of note was a second region in the southwest, which saw proliferation of minor central spots followed by a spreading tendency. Remaining groups were either more simple magnetic dipoles or else apparently unipolar.

No Coronal Mass Ejections (CMEs) were in evidence in the period, Earth-bound or otherwise.

Solar Wind / Geomagnetic Activity: Solar wind parameters showed ongoing slightly elevated solar wind speeds, abruptly giving way to elevated wind and a CME at 16/2250UTC. The behaviour prior to the arrival of the CME may indicate an ongoing fast wind, which if the case may be back-dated to onset around Saturday 14 September, with a slight increase in solar wind speed and decrease in the number of particles seen passing Earth after this time.

The magnetic field was slightly elevated, rising mid-period and much more sharply after the CME's

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onset to become elevated. EVen after the arrival the north-south component did not spend any protracted period either co- or anti-aligned with Earth's field. The net result of the above solar wind measures was just below G1 minor geomagnetic storm conditions throughout.

Energetic Particles / Solar Radiation: Solar radiation was slightly above normal background levels following the generative Strong-class x-ray flare on 14 September, with a very gradual decline from a peak near 4pfu (i.e. below the S1/Minor Storm threshold of 10pfu).

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is forecast, with a chance of Moderate-class flares. There is a slight chance of an isolated Strong-class flare from the southeastern sunspot group especially given its history. No significant regions are expected to arrive or depart in the period and the risk is deemed roughly constant as a result.

Solar Wind / Geomagnetic Activity: The main inbound CME from the Strong class-related CME on 14 September has now arrived (and the 13 September CME which it may have swept up). A now-moderated likely G1-G2 Minor/Moderate geomagnetic storm is possible within day 1, Tuesday 17 September from these transients. Earth may also already be encountering one of the forecast fast winds and this has probably now peaked. A second 'coronal hole' fast wind may arrive day 2 or 3 (18 or 19 Sep), with further slightly elevated to elevated speeds possible.

G1-G2 is likely in the coming 24-hour period from the CME(s). A lull should ensue around 24 hours hence before the fast wind perhaps succeeds this later Wednesday 18 or perhaps early Thursday 19 September, giving a slight chance of further G1 intervals. The small stature of the responsible 'coronal hole' should mean that this activity is short-lived, with quiet geomagnetic activity perhaps rounding out the four-day period.

Energetic Particles / Solar Radiation: Solar radiation is slightly elevated following the generative Strong-class x-ray flare on 14 September, but remains below the S1/Minor Storm threshold with a peak in the past 24 hours of 4pfu. There is still a chance that S1 minor solar radiation storm levels may be reached day 1, however this risk should relax after midweek UTC to the resting value for the current array of sunspots (around 10% per day).

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	75	20	10	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	40	40	40	40
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	25	15	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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